

# **IRRIGATION FARMERS' ORGANISATIONS: A CASE STUDY OF TARWAN (BIHAR)**

**NIRANJAN PANT**

**GIRI INSTITUTE OF DEVELOPMENT STUDIES  
LUCKNOW**

October, 1980

Working Paper No.27

IRRIGATION FARMERS' ORGANISATIONS :  
A Caste Study of Tarwan (Bihar)

Niranjan Pant

GIRI INSTITUTE OF DEVELOPMENT STUDIES,  
LUCKNOW

October 1980

## IRRIGATION FARMERS' ORGANISATIONS :

### A Case Study of Tarwan (Bihar)\*

Niranjan Pant

#### Theoretical Controversy

The literature pertaining to hydraulic theories is subject to various types of theoretical propositions which sometimes are of opposite nature. The major controversy centres around the centralised/decentralised authority structure for irrigation management. The centralists led by Steward and Wittfogel have posited that large-scale irrigation requires centralized co-ordination and direction of efforts, which, in turn, leads to greater political integration. Thus, they have proposed that irrigation is a major "cause" of the emergence of centralised political authority and supra community political organizations and, as such, a major "cause" of the development of early states and civilizations. Steward proposed that the "irrigation civilizations" (Egypt, Mesopotamia, China, Mesoamerica, and the Central Andes) had common basic cultural features and developmental sequences because their adaptation to an arid or semi-arid environment required large scale irrigation.<sup>1</sup>

---

\* An earlier version of this paper was presented in the workshop on Farmers' Organizations For Efficient Use in Irrigated Agriculture, IIM, Bangalore, August 8-10, 1980. (The author wishes to acknowledge the assistance provided by Mr. R.K. Verma in the collection of the data and ANS Institute of Social Studies, Patna, for financial support for this study.)

Wittfogel has put forward the thesis that large scale irrigation results in authoritative political patterns, even to "oriental despotism". Hydraulic agriculture requires great co-operative effort, organizing capital and labour to build dams and canals, for example, and this has been provided typically by an all powerful "agromanerial" bureaucracy.<sup>2</sup>

Steward-Wittfogel thesis is subject to criticism by an array of scholars. Millon finds, "no clear relationship between degree of centralization of authority and the size of the irrigation system or the number of persons it supports".<sup>3</sup> Leach argues that although there were large irrigation works in Ceylon, there is no evidence that such irrigation works produced the hydraulic bureaucracy required by Wittfogel's thesis.<sup>4</sup> Similarly the findings of Mass's recent study go contrary to Wittfogel's thesis. "To get the demands for co-operative effort in hydraulic agriculture, which are indeed great, the water users of Spanish and U.S. systems have shown a genius for inventing operating procedures that avoid centralised and despotic political power. Systems that were in existence before the central government invested money and technical expertise have to a remarkable extent protected their autonomy and even defied national policies that are supposed to accompany national money if these policies have been a serious threat to local custom".<sup>5</sup>

Recently some scholars have been arguing in favour of a reformulated Wittfogel hypothesis "to state that if there



is centralized direction of irrigation activities in arid and semi-arid environment, then there will be a corresponding increase in centralized political power in other areas of social life. The extent of political power will vary directly with the extent of the irrigation system and its importance to the total economy".<sup>6</sup> Similarly a compromising thesis has been advanced by Robert Hunt on the basis of the preliminary findings of a comparative study of canal irrigation systems drawn from Japan, Taiwan, Phillipines, Sri Lanka, Iraq, Spain and Mexico. "The major argument is that all irrigation facilities are unified operations at some level and the unified executive has responsibility for allocation, maintenance and conflict resolution. Some systems contain irrigation communities and some exhibit political centralisation. Some are unified from the top down, by means of a politically centralized bureaucracy. Others are unified from the bottom up, by means of irrigation communities".<sup>7</sup>

#### Participation and Development

In spite of the position taken by some of the authors a large number of studies of rural development both at the national level and at the project level have emphasised the importance of participation for rural development. A sixteen country comparative analysis of Asian experience by the rural development committee at Cornell university found national success, measured in terms of both agricultural productivity and social welfare measures, strongly correlated with effective

systems of participatory local organizations linking rural communities to national centres of decision-making and implementation.<sup>8</sup> Owens and Shaw argue that the "first step in development is to organize the mass of the people in autonomous local institutions".<sup>9</sup> Similarly Schumacher is of the opinion that, "development does not start with goods, it starts with people and their education, organisation, and discipline. Without these all resources remain latent, untapped potential".<sup>10</sup> Sartaj Aziz in a recent study has suggested a model for rural development based on the Chinese experiences. One of the most important elements of the model is the "organization of the rural population for collective or cooperative activities appropriate to the stage of development and to the level of technology that has been reached".<sup>11</sup>

#### Irrigation Farmers' Organisations

What applies to rural development in general applies to irrigation development and its utilization in particular. Mass on the basis of his recent study concludes : "To succeed for any length of time, to capture and distribute available water, and to control the amount of land placed under irrigation, farmers must develop self-discipline and a high level of community organization. We have observed these forces operating in a number of the World's deserts, especially those of south-eastern Spain and Western United States."<sup>12</sup>

Irrigation projects with their complex engineering and bureaucratic organizations can not be successful without the

active participation of beneficiary farmers in the management process. The findings of various scholars like Mass, Coward, Levine, Lowdermilk, Freeman, Wickham, Taylor and Abel have shown that local collective organizations have been very effective in the irrigation management process in terms of distribution of water, maintenance of water supply structures and resolution of conflicts at the local level.<sup>13</sup> Consequently the literature on irrigation management in recent years has given increasing attention to the value of organized participation by water users in the management process.<sup>14</sup>

In India, irrigation systems were built as early as the second century A.D., and their maintenance by water users also dates back to antiquity.<sup>15</sup> The Vayiramega - tataka (Circa 775 - 820 A.D.) of Uttiranmerur in the Chinglaput district was probably built during the times of Pullam Kings. "After its construction by the King its management and repairs seem to have been entrusted to be looked after by village authorities or private individuals".<sup>16</sup> According to the inscriptions (Circa 1367 - 1375) boats were used to remove the silt from dams and tanks and carts were kept for putting the earth on the bunds annually and keeping them in good condition. "To meet the expenses a small quantity of paddy on the cultivable land collected from the villagers was used".<sup>17</sup>

In recent years the issue was first highlighted by Henry Hart. Writing two decades earlier on Damodar Valley administration he said that the real problem was that of establishing

and maintaining local institutions for irrigation which may fulfil new roles. He mentioned, "the system of regulating turns at the ever flowing channel night and day, in the Punjab villages," as a fine example in this regard.<sup>18</sup> Reidinger, writing in mid-seventies also suggested creation of "water users" association at the watercourse level. This, he thought, would increase flexibility of water-supply within a watercourse, which was not possible under fixed warabandi system.<sup>19</sup>

After two decades Henry Hart has raised the issue of collective responsibility afresh. In a recent paper he has put the issue as follows : "One can make out, in 1978, a whole series of choices being made which will tend to establish the future structure of government-cultivators relationships over the irrigated third of India. Immediate placing of obligations on farmers through government authority, possibly followed by political rejection of those obligations, is one structural form. Building collective responsibility among irrigation farmers from the start seems logically to be the alternative".<sup>20</sup>

It is generally agreed that irrigation system cannot function properly unless beneficiary farmers are ready to perform part of the work done by the paid officials. Government of India's strategy for command area development includes from the start farmer organizations as necessary to run the micro-system.<sup>21</sup> Government's concern for the organization of the poor is explicitly manifested in the present Five

Year Plan, which says, "critical for the success of all redistributive laws, policies and programmes is that the poor be organized and made conscious of the benefits intended for them . . . The general lesson of the experience so far is that because of leakages in delivery system and ineffective administration, rural programmes fail to improve the distribution of income. The Planning Commission is proposing a massive shift of resources in favour of rural areas with an inbuilt redistributive character in almost every programme. But whether the larger resources will have the desired equality effect will depend on the extent to which the organised pressure of the beneficiaries counteracts the weaknesses of the administration and the opposition of the vested interests."<sup>22</sup>

Asopa and Tripathi have advocated the creation of water cooperatives as organizational and operational vehicles for ensuring stable and predictable supplies of water to cultivators. They have envisaged three stages of growth for these cooperative organizations. In the first stage the cooperatives are expected to be mainly concerned with the evolution of functional water scheduling policies. In the second stage, in addition to their irrigation functions, they could become a reliable source for timely supplies in adequate quantities of the agricultural inputs. In the third stage these cooperatives could assume the role of an intermediary organization between the irrigation department and the irrigation. They could purchase water at negotiated rates in bulk from the irrigation

department and distribute it to the members at a price that would leave an appropriate margin for the cost involved."<sup>23</sup>

The local association of irrigation farmers consisting say for instance, of users of the same watercourse, can be effective institutional means of not only solving local irrigation problems but may also work as a pressure group to safeguard their interests. This is equally important in the Indian scene where the idea seems to be gaining ground that instead of public administration, we have 'pressure' administration, i.e. administration working only under pressure of different kinds. That without pressure, administration does not move.<sup>24</sup> Unfortunately such organisations are weak or non-existent in India and most of the existing organizations are in practice unimportant.<sup>25</sup> However, Henry Hart who visited seven command area development projects in India during July-August 1978 found farmers collective efforts successful in two projects, namely Pochampad in Andhra Pradesh and Sharda Sahayak in Uttar Pradesh. The water users organisations were named as "pipe committees" in Pochampad and "kulaba" (pipe outlet) samitis in Sharda Sahayak.<sup>26</sup>

In Bihar farmers collective efforts have not been a feature of the large scale irrigation systems. Around mid-seventies, a Committee at the watercourse level, created by the State Government, consisting of VLW, patrol, two representatives of beneficiaries and the mukhiya of the respective panchayat, no doubt existed, but on paper alone. However,

on account of insistence from the Central Government, the Command Area Development Agencies in Bihar have been trying to step in to create such water users organisations which may be of help in the maximum utilization of irrigation potential in their respective commands. After 1977 seventeen cooperative irrigation (Chak) societies have been registered in the Sone Command Area. Their district-wise distribution is as follows, one in Bhojpur, two in Rohtas, four in Aurangabad and ten in Patna.<sup>27</sup> While most of these societies are in their rudimentary stage, only one society in Patna district shows any promise and it is this society which would be discussed in the pages to follow.

#### Tarwan Cooperative Irrigation Chak Society

The idea of cooperative chak society was given by the Agricultural Finance Corporation in its project reports on Sharda Sahayak,<sup>28</sup> Kosi and Sone. The reports suggested that the association of irrigation farmers be called Chak Sabha or Outlet Association because the area falling under the elementary irrigation-cum-drainage system is commonly known as chak in U.P. and Bihar. It would consist of the command of a group of two or more outlets. The Planning Commission has suggested that the command should be of about 60 hectares. All the persons owning land and receiving irrigation within the defined chak from canal and supplementary sources would be members of this association.



According to the model bye-laws<sup>29</sup> framed by the Co-operative Department of Government of Bihar, a cooperative irrigation chak society is one which is registered under the Bihar and Orissa Cooperative Societies Act (Act VI of 1935). Every person owning land or recorded under raiyats in the area of operation of the society shall be eligible to become a member of the society and would constitute a member of the general body which would be supreme authority of the society. The management of the society shall vest in a Managing Committee of seven members. All the members of the managing committee will be elected by the general body. The society would have a Chairman, a Secretary and a Treasurer. The main purpose of the society will be to maintain common irrigation and drainage works of the chak; to own or hire appliances, water pumps and plants for the irrigation of the land of the members; to maintain the irrigation structures in the chak and to regulate and supervise the supply of water in the chak and distribute it to the members' fields in the most just manner. The capital of the society shall be made up of shares of Rs.25/- each. Each member will have to subscribe at the rate of atleast two shares per acre of his land to be irrigated. It can, however, raise funds from members and cooperatives and other institutions.

Tarwan village was selected by Sone Command Area Development Agency with a view to make a demonstration of 'on-farm' development works which included consolidation of holdings and provision of field channels, field drains and



farm roads. In Tarwan village the Sone CAD authorities, the Mukhiya of the village Panchayat, the Project Officer and the Agriculture Officer of Naubatpur block had several meetings with the farmers of that village on 25-3-1976, 3-5-1976 and 4-5-1976 for convincing the farmers for the formation of the chak (voluntary consolidation of holdings) and OFD demonstration. The Mukhiya who is a graduate and ex-headmaster of a high school played a decisive role in convincing the farmers about the advantage of consolidation of holdings and later in the formation of the chak society. By April 1977, the work pertaining to consolidation of holdings was completed and on 28th April 1977 a meeting, consisting of affected farmers and officials, was called for discussing the construction of field channels etc. For the supervision of the construction work Mr. Ramnath Prasad Singh (present secretary of the Society) was selected as a headman from the farmers' side. Later on instructions were given to the agriculture wing of the block from the higher authorities for giving technical assistance to the farmers of Tarwan chak society.<sup>30</sup>

#### Salient Features of the Chak and the Village

The chak consisting of 127 acres forms a part of the village Tarwan. All the 77 chak members (those having land in the chak) hail from the same village. The village is situated on the left bank of Rewa distributory at a distance of 5 km. from the Naubatpur block headquarter and the police

station. The village is served by the Bikram Sub-division of irrigation department which is about 11 km. from the village. Patna is 40 km. north west of the village. The village has a primary health centre attended by a homeopathic doctor and also a primary school for the children. Middle and high schools are in Naubatpur and a college at a distance of 8 km. from the village. The village has a gram panchayat.

The total population of the village according to 1971 Census is 1,210. The occupational engagement of the population is as follows : cultivation 241 (226 male + 15 female), agricultural labour 188 (103 male + 85 female), household industry 8 (5 male + 3 female), trade and commerce 12 (9 male + 3 female), transport and communication 1 (male) and other services 16 (all male). The total working population of the village is 466 (360 male + 106 female) and the non-workers are 744 (272 male + 472 female). Out of the total population the number of the literates in the village is 349 (262 male + 87 female). There are 232 (109 male + 123 female) scheduled castes in the village. In terms of caste structure, 29.5% households consist of Bhumi-hars, 33% of backward castes (Ahir, Kori, Garedi, Kahto, Bania, etc.), 29.5% of scheduled castes and 5.4% of Brahmins. Ahir alone constitute 12.3% of the total households.<sup>31</sup>

Total area of the village is 301.85 acres. Out of it, 30.13 acres of land is uncultivable. Net sown area is

271.72 acres in which more than one crop is sown. In matters of irrigation facilities the sources are as follows : 8 wells, 5 tubewells and 2 pumpsets. The canal irrigation is served by Bikram Sub-division (Irrigation). New Rewa distributory rising out from Patna main canal at Bikram crosses through the village. Five outlets have been provided for the village, each of 6" diameter, having a supply of one cusec of water. There is one VLW for the village under the TV programme. Three crops are sown in the village and the rotation is as follows : Kharif consisting of paddy, rabi consisting of maize, wheat and pulses, and hot weather consisting of munga (kidney bean), til (sesamum seeds) and maize. Paddy is sown in 232.18 acres (197.6 acres irrigated and 34.58 unirrigated), wheat is sown in 148.20 acres.<sup>32</sup> No pucca road passes through the village, one unmetalled road links the village with Naubatpur - Bikram road.

#### Formation of Tarwan Chak Society

In March 1976 Sone CAD authorities wrote to the Project Officers of Naubatpur and Bikram for the sites for OFD demonstrations. It was mentioned that "the area of the command should be at least 100 acres in contiguous plot".<sup>33</sup> When Mr. Umesh Prasad Singh, Mukhiya of Tarwan Panchayat came to know about this scheme he contacted officials of the Block and Sone CADA and made all out efforts that the site was chosen from Tarwan village. He also motivated and convinced the farmers that the distribution of the chaks will be done by the representatives of the beneficiaries and made them ready for voluntary

consolidation of holdings. The layout of the work was done by the Sone CADA and the land measurement was done by the Revenue Department. The work involved the following important steps.<sup>34</sup>

- i. An application for voluntary consolidation of holdings was written to the collector, Patna district, containing signatures of all the 77 beneficiaries and the details of land records.
- ii. A general meeting (on 19-9-1978) of all the beneficiaries was called, a managing committee of seven members was constituted and the name "chak samiti" was given to the society. One of the members was elected as President and another as Secretary of the Samiti.<sup>35/</sup>
- iii. During the course of measurement 2.5% of land was charged from each farmer for providing farm roads, channels and drains. But no land was charged from those who owned less than one acre of land.
- iv. To the extent possible small farmers were placed at the privilege points (near the head of the channels).
- v. The chaks of all the farmers were re-allocated in between the irrigation and drainage channels and it was so placed that at one end there was irrigation channel at the top and drainage channel at the bottom. To the extent possible it was also tried to provide the facilities of farm roads to every chak. (See attached Fig. 2).

Prior to the formation of Tarwan chak society there were 537 total number of plots but after the consolidation of holdings their number was reduced to 108 chaks. As a consequence of OFD works the chak has a total of 5,209 ft. of lined and 5,135 ft. of unlined channels and 19, 171 ft. of drainage channels. Farm roads to a total length of 8,510 ft. have also been provided. The total cost involved was Rs.101,292.66 (per acre cost Rs.797.64) and it was met by the Sone CADA in the form of a subsidy.<sup>36</sup>

The soil of the area is sandy loam having fine texture. In most of the area the soil is quite deep except in the northern portion, covering an area of about 25 acres. The general slope is 0.2% and the direction of the slope is towards north. The average rainfall of the locality is 37.1 inches (on ten years average data basis - source - Naubatpur block). The water requirement for the two main crops is 37" for paddy and 15" for wheat.

The major portion (75.06%) of the 127 acres Tarwan chak belongs to the Bhumihars. In the membership of the Samiti also they outnumber others (49 out of 77). The average land holding per Bhumihar comes to 1.90 acres. The representation of other castes in the chak and their average holding per head are as follows : Brahmins 4 (average 1.87 acres), Garedi 7 (average 0.21), Yadava 1 (average 0.11), Bania 6 and Mahto 3 (both average 0.26). No scheduled caste is represented in the chak though they constitute 29.5% of the total village population. Most of the larger holdings belong either to Bhumihars or to Brahmins.

#### Working of the Chak Samati

Most of the OFD works in the chak were completed by the first quarter of 1978 and water was first provided by the newly constructed canal structure for the summer crop in 1978. Though no formal organisation was formed by that time. Mr. Umesh Singh, Mukhiya of the gram panchayat was the leader of the group which constituted the chak. The formal chak samiti and its managing

committee were formed by the general body in its meeting on 19-9-1978. In this section of the paper the working of the chak samiti would be examined in terms of participation, distribution and maintenance, conflict resolution, social justice, productivity and interaction with government and other institutions.

The samiti members did not appear to be active participants in the samiti affairs. Since its inception in September 1978 till April 1980, only one meeting of the general body (attended by 17 of 77 members) had taken place, whereas the samiti bye-laws make it mandatory that the General Body must meet once a year at least. Similarly the management committee has also met only thrice during this period (25 October 1978, 12 November 1978 and 14 February 1979) and has not met at all for over a year. Though the committee consists of 7 members and 2 scheduled caste permanent invitees, it was attended by 5 members in two meetings and by 3 members in the last meeting.

As regards the distribution of water in the individual fields, the plan is made in such a way that each field gets water independently from the <sup>nearest</sup> field channel. As for the timing and the sequencing of water, particularly during scarcity, the members have agreed on certain norms and procedures which are generally followed. As far as the maintenance of the irrigation structure is concerned the time has not yet come for that. It is mainly because the constnction work has not yet been fully completed and the question of maintenance would arise only after the work is fully completed.



Conflict resolution has been evoked on three occasions. On two occasions conflicts related to disagreement between the parties over the sequencing of water. On both the occasions President's verdict was accepted by the parties though agrieved parties questioned the impartiality of his judgement. On the third occasion a collective unanimous decision was taken and "greater loss was avoided at the cost of lesser loss". The problem involved was water drainage. It arose on account of heavy rains during the monsoon period in 1978. The water logging problem arose because the drainage outlets could not receive the excess water of all the fields. In the natural process the extra water of a field of upper reach is drained first and only after it is exhausted the extra water of the field down reach can be received by the drainage channel. However, in some cases upper fields were much bigger than the down ones and the drainage of water bigger upper fields would have taken a much longer time than the small fields of down reaches and it would have damaged the crop of the down fields due to water logging. Therefore, a unanimous decision was taken according to which upper fields were allowed water drainage where these were of small size but where higher fields were of big size small fields of down reaches were allowed drainage first.

The samiti has tried to impart social justice. When the managing committee was being formed and it was found out that there was no scheduled caste member in it, two scheduled caste members were included in it as permanent invitees. Similarly in the re-allocation of chaks after consolidation

of holdings the plots of small farmers were placed at privilege points. Further, no land was charged from the small farmers while from others 2.5% of land was charged for OFD works.

Before the consolidated chak came into being the crop intensity was 177% but after OFD works it rose to 200% in 1978-79. In that year a short duration variety of summer paddy ('sita') was sown in part of the chak. Thus, two crops in 127 acres and three in 30 acres were sown. However, in 1979-80, due to unprecedented drought, canal failed to give any water so chak farmers were trying for the installations of tubewells as an alternative source of irrigation.

3849

After the formation of the samiti, the chak farmers' interaction with the government and other financing institutions has increased considerably. Many resolutions have been passed by the managing committee for various types of help to be rendered to the chak members. Some of those are : request for loans in cash or in kind to the individual farmers from the cooperative and other banks, taking help from the Rural Engineering Organization and Sone CADA for the cementing of the sides of farm road, request for the payment of the estimated money from the Cooperative Department for the construction of a godown for the storage of the grains, request to the Minor Irrigation Department for the installation of three 6" diameter tubewells and request for a power tiller from Sone CADA.



To sum up, considerable improvement has been made in the agricultural conditions in the 127 acre chak of the Tarwan village. Most of the improvement has been caused by the OFD works for which Sone CADA provided a subsidy of over one hundred thousand rupees (which comes to about Rs.800 per acre). Therefore, it is natural to assume that the success of the Tarwan farmers irrigation chak society was on account of the high subsidy provided by Sone CADA. However, we should not forget the fact that Sone CADA was willing to provide the subsidy in other areas also but farmers initiative for voluntary consolidation of holdings, which is a very quick process compared to regular consideration of holdings, was not forthcoming. In the words of the Mukhiya, who was the leading force behind the Tarwan programme, "farmers unanimous agreement for voluntary consolidation itself is a success of Tarwan programme". In other areas also effort are being made but there is no unanimity among the landholders. Never the less from our point of view the moot question is, whether farmers can work collectively and successfully in a situation where no such subsidy is provided? If the answer is in the positive, the utilization of irrigation potential can be considerably achieved.

### Notes and References

- 1 Steward, Julian H. : Cultural Causality and Law, American Anthropologist, 51, 1949, pp.1-27.
- 2 Wittfogel, Karl : Oriental Despotism : A Comparative Study of Total Power, New Haven, Yale University Press, 1957.
- 3 Millon, Rene : "Variations in Social Responses to the Practice of Irrigation Agriculture", in Civilizations in Desert Lands; edited by Richard B. Woodbury, University of Utah Anthropological Papers 62, 1962, p.56.
- 4 Leach, E.R. : Hydraulic Society in Ceylon; Past and Present 15:2 - 26.
- 5 Mass Arthur and Anderson, R.L. : . . . and the Desert Shall Rejoice : Conflict, Growth, and Justice in Arid Environments, M.I.T. Press, 1978, p.4.
- 6 Mitchel, W.P. : The Hydraulic Hypotheses : A Reappraisal, Current Anthropology, Vol.14, No.5, December 1973, p.534.
- 7 Hunt, Robert C. : Preliminary Findings of the Project entitled "Canal Irrigation and Local Social Structure", Department of Anthropology, Brandeis University, Waltham, Mass, 02154, U.S.A.
- 8 See, Strategies for Small Farmer Development : An Empirical Study of Rural Development Projects, A Report prepared for the U.S.A.I.D., 2 Vols., Washington : Development Alternatives, Inc., May 1975.
- 9 Owens, Edgar and Shaw, Robert : Development Reconsidered : Bridging the Gap between Government and People, Oxford I.B.H. Publishing Co., New Delhi, 1972, p.13.
- 10 Schumacher, E.F. : Small is Beautiful, Perennial Library Harper and Row Publishers, 1975, p.168.
- 11 Aziz, Sartaj : Rural Development : Learning from China, The Macmillan Press Ltd., 1978, p.100.
- 12 Mass, Arthur and Anderson, R.L. : . . . and the Desert shall rejoice, op cit. p.1.
- 13 One of the most powerful conclusions which emerges from Mass's recent study (see reference Nos.5 or 12) is the observation that farmers of each settlement, acting collectively, rather than the Central Government, have determined both the procedures for distributing a limited water supply and the resolution of conflicts with other groups over the development of additional supplies (p.366).

- 14 See : (i) Reidinger, R.B. : "Institutional Rationing of Canal Water in Northern India : Conflict Between Traditional patterns and Modern needs", Economic Development and Cultural Change; Vol.23, No.1, October 1974. He advocates farmer organizations on each water-course to organize distribution of irrigation water (pp.103-104). (ii) Lowdermilk, Max K. et al : Physical and Socio-Economic Dynamics of a Watercourse in Pakistan's Punjab : System Constraints and Farmers' Responses. C.S.U. Fort Collins, Colorado, December 1975, Water Management Technical Report No.42. "To effectively mount a program of Cooperative watercourse management improvements group cooperation must be reinforced" (p.1). (iii) Freeman, David M. and Lowdermilk, Max K. : Community and Irrigation in the Pakistan Punjab : Physical and Sociological Dimensions of the Water Management Problem, paper prepared for Association of Asian Studies, Toronto, March 1976. They argue "That programmes to improve the management of Irrigation water must center on the design and improvement of farmer irrigation organisations" (p.1). (iv) Coward Jr. Walter E. : Indigenous Organization, Bureaucracy and Development : The Case of Irrigation; The Journal of Development Studies, Vol.13, No.1, October 1976. From a case study in Western Laos the author develops a hypothesis "That indigenous roles can be used for articulating bureaucracy and locality of accountability of job performance remains with the local water user group." (p.92). See also : (v) Coward Jr. Walter E. : Irrigation Management Alternatives : Themes from Indigenous Irrigation Systems; Agriculture Administration; No.4, 1977, pp.223-237. (vi) Coward Jr. Walter E. : Small Groups and Large Projects : Technology, Organization and Irrigation Programs; paper presented to 13th American Water Resources Conference, Tucson, Arizona, 1977. (vii) Coward Jr. Walter E. and Ahmed Badruddin : Village, Technology and Bureaucracy : Pattern of Irrigation Organization in Comilla District, Bangladesh, July 1978. (viii) Coward Jr. Walter E. and Levine, G. : The Analysis of Local Social Organization for Project Preparation Studies : An Exploration of Possibilities prepared for the World Bank, 1978. (ix) Levine, G. : Hardware and Software : An Engineering Perspective on the Workshop on Irrigation Research, IRRI, Los Banos, Phillipines, March 26-30, 1979. (x) Taylor, Donald C. and Wickham Thomas H. (ed.) : Irrigation Policy and the management of Irrigation System in South East Asia, Agricultural Development Council, Inc. Bangkok, (xi) Abel, Martin E. : Irrigation System in Taiwan : Management of a Decentralized Public Enterprise : Water Resources Research, Vol.12, No.3, June 1976. (xii) Radosevich, George : Improving Agricultural Water Use : Organizational Alternatives; Washington D.C. : USAID, Office of Rural Development, March 1977. (xiii) Saunders, Robert S. : Technical Cooperation, Indigenous Peasants Groups and Rural Development : A Look at Possibilities and Experiences, Background

- Memorandum prepared for the World Bank, August 1977.
- (xiv) Hunt, Robert and Hund, Eva : Canal Irrigation and Local Social Organization; Current Anthropology, Vol. XVII, No.3, 1976. (xv) Wade Robert : Collective Responsibility in Construction and Management of Irrigation Canals; Economic and Political Weekly, Vol.XIV, No.51 & 52, December 22-29, 1979 (Review of Agriculture) pp.A155-A160. (xvi) Nickum, James E. : An Instance of Local Irrigation Management in China : Economic and Political Weekly, VolXII, No.40, October 1, 1977, pp.1714-1716.
- 15 Report of the Irrigation Commission; Ministry of Irrigation and Power, Government of India, New Delhi, Vol.1, 1972, pp.60-82.
  - 16 Irrigation in India through Ages; Central Board of Irrigation and Power, Popular Series, Leaflet No.2, Second Edition, 1953, p.11.
  - 17 Ibid., p.22.
  - 18 Hart, Henry : Administrative Aspects of River Valley Development, Asia Publishing House, Bombay, 1961, pp.54-55.
  - 19 Reidinger, R.B. : Op cit. pp.103-104.
  - 20 Hart, Henry : Anarchy, Paternalism, or Collective Responsibility under the Canals? Economic and Political Weekly, Review of Agriculture, December 1978, p.A133.
  - 21 Ministry of Agriculture and Irrigation, Water Management Division, "New-Mid-Term Plan . . . relating to Command Area Development" (New Delhi : Ministry of Agriculture and Irrigation, 1977) p.22. The early CAD Pilot projects, also, were partly intended to develop and try out such farmer organisations.
  - 22 Draft Five Year Plan, 1978-83, Government of India, Planning Commission, April 1978, p.15.
  - 23 Asopa, V.N. and Tripathi, B.L. : Water Cooperatives for Utilization of Irrigation Potential in Gujarat - in Role of Irrigation in the development of India's agriculture, Seminar series - XIII, the Institute for Social and Economic Change, Bangalore, December 1976, pp.59-65.
  - 24 Jagannadham, V. : Public Administration and the Citizen : How far, Public Administration can be Public? Indian Journal of Public Administration, Vol.XXIV, No.2, April-June, 1978, pp.355-373.
  - 25 Wade, Robert : Water to the fields : India's changing strategy; South Asian Review, Vol.8, No.4, July/October 1975, p.311.

- 26 Hart, Henry : Anarchy, Paternalism, or Collective responsibility under the canals? Op cit. pp.A125-A134.
- 27 Based on a discussion with the Joint Registrar, Cooperatives, Bihar on 13-2-1980.
- 28 CAD Project Report for Bhawanipur, Mudha Distributories, Sharda Sahayak, prepared by AFC Ltd., 1975, pp.222-223.
- 29 Model Bye-laws of Cooperation Irrigation (Chak) Society Ltd., published by Sone CADA.
- 30 The account is based on records available at BDO office Naubatpur and office of the Assistant Director, Soil and Water Management, Sone CADA, Phulwarisharif (Patna).
- 31 Calculated on the basis of figures supplied by the Ex-Mukhiya, Mr. Jagat Narain Singh.
- 32 Same as reference No.30.
- 33 Telegram from Joint Director, Agriculture to project officer, Naubatpur.
- 34 This section is based on the information obtained from a note entitled, "On-Farm Development Work" (including new concept of land consolidation), village - Tarwan, Block - Naubatpur, District - Patna, prepared by Mr. G.S. Gupta, Assistant Director, Soil and Water Management, Sone CADA, Phulwarisharif (Patna).
- 35 Resolution No.2 of the General Body Meeting of Tarwan Cooperative Irrigation Chak Society on 19-9-1978.
- 36 Same as reference No.34.

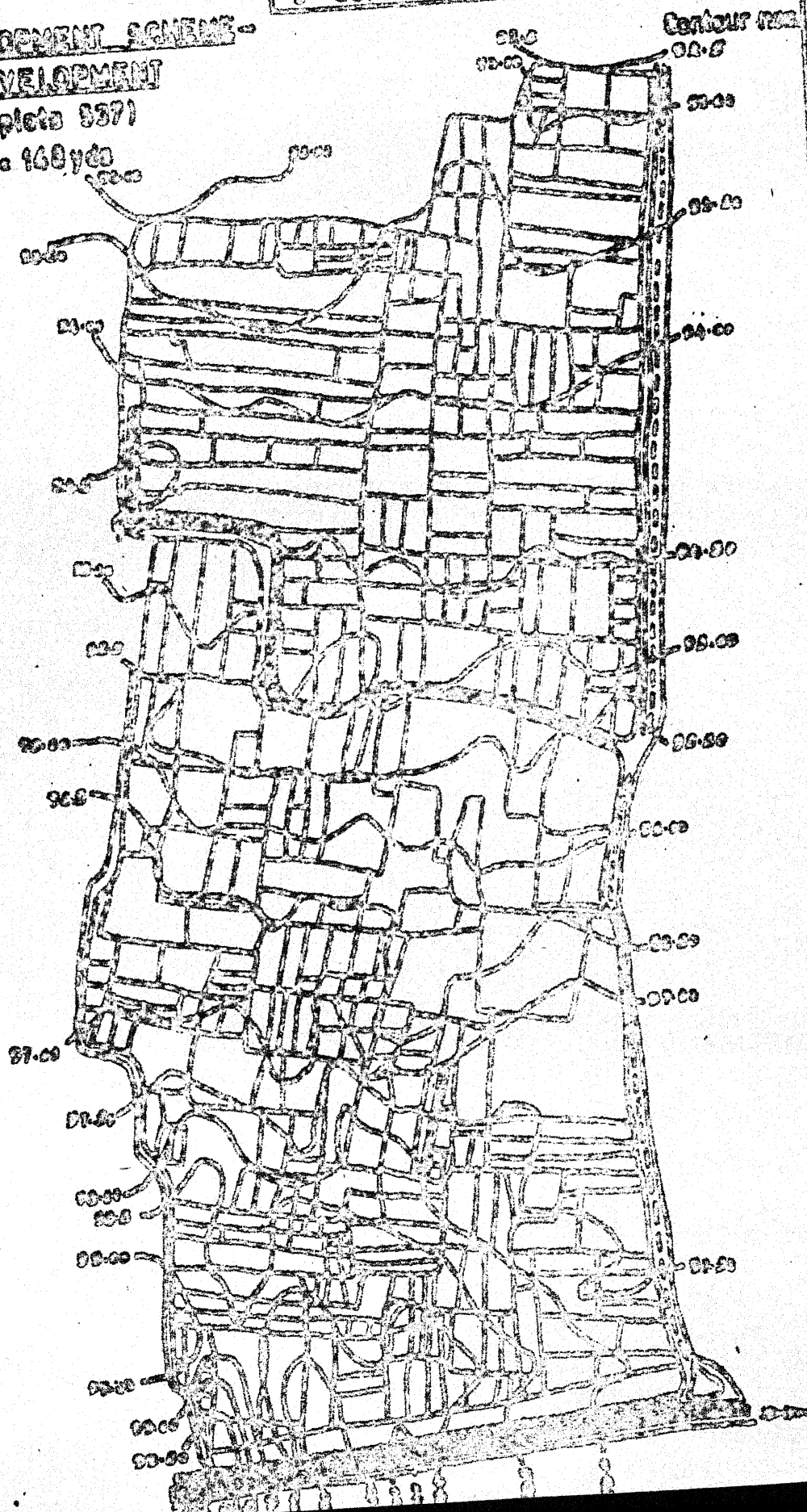


Legend	
1	Distributory
2	Village road
3	Contour line

FIG. 1 - AREA DEVELOPMENT SCHEME -  
BEFORE DEVELOPMENT

(Total no. of plots 937)

Scale: 1" = 160 yds



1	BEAR HILLS	
2	WATER CHARGE	
3	SEWERAGE CHARGE	
4	POOR ROAD	
5	WATER FEE	
6	SEWERAGE FEE	
7	WATER CHARGE CHARGE	

**FIVE DAYS OF THE WEEK**

(Farman circle Naubatpur district, Patna)

(Total no. of plots 106)



Seals: 1" x 148 yds

